
The Gravity and Extreme Magnetism Small Explorer (GEMS)

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The Gravity and Extreme Magnetism Small Explorer (GEMS) was selected by NASA for flight in 2014 to make a sensitive search for X-ray polarization from a wide set of source classes, including stellar black holes, Seyfert galaxies and quasars, blazars, rotation and accretion-powered pulsars, magnetars, shell supernova remnants and pulsar wind neulae. Among the primary scientific objectives are determining the effects of the spin of black holes and the geometry of supermassive black hole accretion, determining the configurations of the magnetic fields and the X-ray emission of magnetars, and determining the magnetic structure of the supernova shocks in which cosmic rays are accelerated. GEMS will observe 23 targets during a 16 month prime mission, in observations that will be able to reach predicted levels of polarization. The mission can be extended to provide a guest observer phase. The GEMS instrument has time projection chamber polarimeters with high 2-10 keV efficiency at the focus of thin foil mirrors. The 4.5 m focal length mirrors will be deployed on an extended boom. The spacecraft with the instrument is rotated with a period of about 10 minutes to enable measurement and correction of systematic errors. A small Bragg reflection soft X-ray experiment takes advantage of this rotation to obtain a measurement at 0.5 keV. The design of the GEMS instrument and the mission, the expected performance and the planned science program will be discussed.